

MODIS Radiometric Calibration and Uncertainty Assessment

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ABSTRACT

Since launch, Terra and Aqua MODIS have collected more than 11 and 9 years of datasets for comprehensive studies of the Earth's land, ocean, and atmospheric properties. MODIS observations are made in 36 spectral bands: 20 reflective solar bands (RSB) and 16 thermal emissive bands (TEB). Compared to its heritage sensors, MODIS was developed with very stringent calibration and uncertainty requirements. As a result, MODIS was designed and built with a set of state of the art on-board calibrators (OBC), which allow key sensor performance parameters and on-orbit calibration coefficients to be monitored and updated if necessary. In terms of its calibration traceability, MODIS RSB calibration is reflectance based using an on-board solar diffuser (SD) and the TEB calibration is radiance based using an on-board blackbody (BB). In addition to on-orbit calibration coefficients derived from its OBC, calibration parameters determined from sensor pre-launch calibration and characterization are used in both the RSB and TEB calibration and retrieval algorithms. This paper provides a brief description of MODIS calibration methodologies and discusses details of its on-orbit calibration uncertainties. It assesses uncertainty contributions from individual components and differences between Terra and Aqua MODIS due to their design characteristics and on-orbit performance. Also discussed in this paper is the use of MODIS L1B uncertainty index (UI) product.

Keywords: Terra, Aqua, MODIS, calibration, uncertainty